FAA Industry Training Standards (FITS)

Scenario Based Transition Syllabus

For GPS with Moving Map Displays

Version 1.1

FITS Master Syllabus
Scenario Based Transition Guide

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How to use this generic FITS Syllabus

This FITS GPS with Moving Map Display (GPS) Syllabus is intended as a guide for aircraft manufacturers, training providers, and flight schools to use in developing a specifics FITS curriculum for a specific aircraft, geographic region, and customer base. The syllabus lays out a series of flight scenarios that enable a pilot transitioning into an airplane equipped with GPS technology that depicts information on a display, to master the technology, use the information displayed effectively in navigation and in maintaining situational awareness, and most importantly the concepts of Risk Management and Aeronautical Decision Making.

To Instructors

Each lesson consists of a scenario description followed by a list of specific tasks to be accomplished by the student. Each scenario also includes a "student centered" set of grading criteria. Within the confines of each scenario the Pilot in training (PT) and instructor are free to plan all the training activities in a way that supports the overall scenario flow, and provides the most realistic replication of real world, day to day flying.

To Pilots in Training (PT)

The emphasis in each scenario is on PT planning and the execution of each scenario with as little help as possible from the instructor. The value of scenario-based training is in the opportunities it provides to plan, execute, and respond to changing situations in a thoughtful way.

To Aircraft Manufacturers, Training providers, and Flight Schools

This generic syllabus is a guide for you to use in developing your specific transition curriculum. FITS acceptance is achieved by developing your specific curriculum and submitting it to:

The FITS Program Manager,
800 Independence Avenue, SW, Washington DC, 20591
202 -267-7922

Use of the FITS logo.

Once FITS accepted you are authorized to display the FITS Logo on approved FITS curriculums and in advertising about this particular curriculum. The FITS logo will not be used in relationship to non-FITS products.

Section 1 - FITS Introduction

FAA Industry Training Standards (FITS)

The FITS Program is a joint project of the FAA, the FAA -sponsored Center for General Aviation Research (CGAR), Embry Riddle Aeronautical University, The University of North Dakota, and various organizations and associations representing the General Aviation industry.

FITS Transition Training Mission Statement:

Improve pilot training to enable pilots to more safely, competently, and efficiently operate a Technically Advanced Aircraft (TAA) in the National Airspace System (NAS).

FITS "Essentials":

Pilot training in TAA requires an emphasis on realistic scenario-based training that will develop essential risk management skills, decision-making skills, and other higher-order thinking skills that are crucial in helping to reduce the general aviation (GA) fatal accident rate. Reduction of the GA fatal accident rate is one of the cornerstones of the FAA's "SAFER SKIES" initiative. FITS scenario-based training will also involve training for new communication, navigation and surveillance (CNS) systems, related airspace and procedures, and the problem of new-entrant pilots flying for transportation purposes

FITS recognizes the variety of advanced technology systems and the different combinations and permutations of these systems-

- Within a type of system (e.g. different operations of GPS navigators)
- Within categories of advanced technology systems such as a-
    - o Primary Flight Display (PFD) that normally includes the following primary information on a single display:
        - Attitude
        - Heading
        - Altitude
        - Airspeed
        - Navigation (HSI, bearing, course, ground speed, etc.)
    - o Multi Function Display (MFD) that could include any combination of the following information on a single display:
        - Traffic
        - Weather
        - Terrain
        - Navigation (bearing, course, ground speed, ETA, Sectional, Enroute or Terminal Approach charts, etc.)
    - o Autopilot

FITS Training Goals

The advancement of:

- Higher Order Thinking
  - Risk Management
  - Aeronautical Decision-Making
  - Situational Awareness (SA)
  - Pattern Recognition (Emergency Procedure) and Decision-Making
- Aircraft Systems Competence
- Planning and Execution
- Procedural Knowledge
- Motor skills that do not require higher cognitive thinking before taking action (i.e. Psychomotor Skills.)

Section 2 - FITS Terminology/Definitions

Key Terms

Technically Advanced Aircraft (TAA)– is a general aviation aircraft that contains a GPS navigator with a moving map display, plus any additional systems. Traditional systems such as autopilots when combined with GPS navigators are included. It includes aircraft used in both VFR and IFR operations, with systems certified to either VFR or IFR standards. Note: there will be application to non-TAAs.

Light Turbine TAA- a jet or turboprop TAA certified for single-pilot operations, weighing 12,500 lbs or less, equipped with cabin pressurization, conventional (non-swept) wings and capable of operating in Class A airspace on normal mission profiles. (Note: Light Turbine TAA is specifically defined as having a non-swept wing due to the significantly increased training demands for pilots transitioning to swept wing aircraft)

Scenario-based Training (SBT) – is training system that uses a highly structured script of real-world experiences to address flight training objectives in an operational environment. Such training can include initial training, transition training, upgrade training, recurrent training, and special training. The appropriate term should appear with the term "Scenario-based," e.g., "Scenario-based Transition Training," to reflect the specific application.

Single Pilot Resource Management (SRM) – is the "art and science" of managing all resources available to a single-pilot to ensure the successful outcome of the flight.

Related Terms and Abbreviations

Aircraft Automation Management – is the demonstrated ability to control and navigate an aircraft by means of the automated systems installed in the aircraft.

Automated Navigation leg – is a flight of 30 minutes or more conducted between two airports in which the aircraft is controlled primarily by the autopilot and the on-board navigation systems.

A **VFR Automated Navigation Leg** is flown on autopilot beginning from 1,000 ft above ground level (AGL) on the departure until the 45-degree entry to the downwind leg in the VFR airport traffic pattern.

An IFR Automated Navigation Leg is flown on autopilot beginning from 500 ft AGL on departure (unless the limitations of the autopilot require a higher altitude, then from that altitude) until reaching the decision altitude or missed approach point on the instrument approach. If a missed approach is flown, it will also be flown using the autopilot and on-board navigation systems.

Automation Competence- is the demonstrated ability to understand and operate the automated systems installed in the aircraft.

Automation Surprise- is the ability of an automated system to provide different cues to pilots when compared to the analog systems they replace, especially in time-critical situations.

Automation Bias – is the relative willingness of the pilot to trust and utilize automated systems.

Candidate Assessment- is a system of critical thinking and skill evaluations designed to assess a student's readiness to begin training at the appropriate level.

Critical Safety Tasks/Events – are those mission related tasks/events that, if not accomplished quickly and accurately, may result in aircraft damage, injury, or loss of life.

Data link Situational Awareness (SA) Systems – are systems that feed real-time information to the cockpit on weather, traffic, terrain, and flight planning. This information may be displayed on the PFD, MFD, or on other related cockpit displays.

Desired Pilot in Training (PT) Scenario Outcomes – The object of scenario-based training is a change in the thought processes, habits, and behaviors of the PT during the planning and execution of the scenario. Since the training is "student-centered," the success of the training is measured in the following desired PT performances:

(I) Learner-Centered Grading involves both maneuver and single-pilot resource management (SRM) grading.

(i) Maneuver Grades (Tasks)

• Explain -- at the completion of the scenario the PT will be able to describe the scenario activity and understand the underlying concepts, principles, and procedures that comprise the activity. *Significant instructor effort will be required to successfully execute the maneuver.*

• Practice -- at the completion of the scenario the student will be able to plan and execute the scenario. *Coaching, instruction, and/or assistance from the CFI will correct deviations and errors identified by the CFI.*

• Perform -- at the completion of the scenario, the PT will be able to perform the activity without assistance from the CFI. *Errors and deviations will be identified and corrected by the PT in an expeditious manner. At no time will the successful completion of the activity be in doubt.* ("Perform" will be used to signify that the PT is satisfactorily demonstrating proficiency in traditional piloting and systems operation skills)

• Not Observed -- Any event not accomplished or required

(ii) Single Pilot Resource Management (SRM) Grades

• Explain -- the student can verbally identify, describe, and understand the risks inherent in the flight scenario. *The student will need to be prompted to identify risks and make decisions.*

• Practice -- the student is able to identify, understand, and apply SRM principles to the actual flight situation. *Coaching, instruction, and/or assistance from the CFI will quickly correct minor deviations and errors identified by the CFI. The student will be an active decision maker.*

• Manage/Decide -- the student can correctly gather the most important data available both within and outside the cockpit, identify possible courses of action, evaluate the risk inherent in each course of action, and make the appropriate decision. *Instructor intervention is not required for the safe completion of the flight.*

• Not Observed -- Any event not accomplished or required.

(II) Grading will be conducted independently by the student and the instructor, then compared during the post flight critique.

(III) Learner centered grading (outcomes assessment) is a vital part of the FITS concept. Previous syllabi and curriculum have depended on a grading scale designed to maximize student management and ease of instructor use. Thus the traditional: "excellent, good, fair, poor" or "exceeds standards, meets standards, needs more training" often meet the instructor's needs but not the student's. The grading scale/system is designed to emphasize two important point in student centered learning. First, the grading system should provide a clear picture about the progress the PT is making during the training. A typical grading scale including outstanding, satisfactory, marginal, and unsatisfactory can be accurate but often carries emotional baggage. That is, student have often been graded by this scale and have learned to identify that they are not doing well if they receive anything other than an outstanding grade on a graded task. Instructors recognize

this problem and attempt to avoid sending negative signals to their students. When this happens, students are not given an accurate picture of the progress. This is often complicated by the problem the instructor has in attempting to show adequate progress during initial phases of training when students are not expected to be able to "Manage/Decide," but rather be able to accomplish the requirement with assistance and coaching. Second, the grading scale needs to communicate the instructor's assessment of the student progress clearly to the PT.

The grading scale needs to clearly indicate the student's progress so that the instructor or another instructor understands the PT progress. Thus, the FITS researcher are recommending a grading system that involves a grading scale designed to provide a better picture of the actual PT progress without the emotional baggage of traditional grading. The learner centered grading described above is a way for the instructor and student to determine the student's level of knowledge and understanding. "Perform" is used to describe proficiency in a skill item such as an approach or landing. "Manage-Decide" is used to describe proficiency in the SRM area such as ADM. Explain and practice are used to describe student learning levels below proficiency in both.

(IV) Grading should be progressive. During each flight, the student should achieve a new level of learning (e.g. flight one, the automation management area, might be a "describe" item by flight three a "practice" item, and by flight five a "manage-decide" item.

Emergency Escape Maneuver- is a maneuver (or series of maneuvers) performed manually or with the aid of the aircrafts automated systems that will allow a pilot to successfully escape from an unanticipated flight into Instrument Meteorological Conditions (IMC) or other life-threatening situation.

Mission Related Tasks- are those tasks required for the safe and effective accomplishment of the mission.

Multi-Function Display (MFD) - is a device that combines primarily navigation, systems, and situational awareness (SA) information onto a single electronic display.

Primary Flight Display (PFD) – is a device that combines the primary six flight instruments plus other related navigation and situational awareness (SA) information into a single electronic display.

Proficiency Based Qualification- is a qualification based on demonstrated performance rather than other flight time or experience.

Simulation- is any use of animation and/or actual representations of aircraft systems to simulate the flight environment. PT interaction with the simulation and task fidelity for the task to be performed are required for effective simulation.

Training Only Tasks – are training maneuvers that, while valuable to the PT's ability to understand and perform a mission related task, are not required for the PT to demonstrate

proficiency. However, instructor pilots would be required to demonstrate proficiency in training-only tasks.

Section 3 - FITS TAA Transition Master Syllabus

Over the years, the airlines and the military have shifted their training philosophy toward a "train the way you will fly in the real world and fly the way you trained" approach to satisfy their flight training requirements. The airlines refer to this training approach as Line Oriented Flight Training (LOFT), and is now considered doctrine in the air carrier community.

The complexity of the national airspace under the FAA's Operational Evolution Plan (OEP) along with the introduction of new cockpit technologies make the idea of LOFT, or "scenario-based" flight training, an idea that demands serious consideration from the general aviation (GA) community.

The challenge is to develop an adaptable flight training system that will not only maintain but will greatly improve the safety and utility of increasingly complex (GA) flight operations. (Wright, 2002)

The concept of "scenario-based" flight training is attracting considerable support. This training approach, when coupled with state-of-the-art simulation and curricula, would be ideally suited to preparing GA pilots for operations in an increasingly complex national airspace system. In particular, it could provide an effective bridge between the training environment and the actual environment pilots will experience. The concept also provides a way for trainees to integrate various phases of training into a unified flight operation. Rather than, for example, conducting practice instrument approaches repeatedly, scenario-based training may enable a pilot to experience the complete transition from enroute to terminal to approach operations. (Wright, 2002)

GOAL

The goal of Transition Training is to prevent accidents by ensuring pilots have proper training in the specified systems and operating characteristics of every airplane model they fly. Transition Training, therefore, concentrates on those areas where the pilot will encounter something that is distinctive or unique to that airplane model. No attempt is made to review general piloting knowledge or skills that would be the same in any airplane. Instruction in these areas is highly beneficial, but should be accomplished through other means.

MASTER SYLLABUS

This Master Syllabus document is a general outline of the items to be included in the ground and flight training of pilots transitioning into technically advanced aircraft (TAA). The Master Syllabus should be used to develop a Transition Training Guide for a specific airplane. "Specific airplane" includes airplane models that are sufficiently similar so that a pilot trained or experienced in one airplane model would not normally require Transition Training to operate another model.

TRANSITION TRAINING GUIDES

A Transition Training Guide is written for a specific airplane and is based on the Master Syllabus. Any person or company such as a certificated flight instructor, training organization, manufacturer, or aviation publisher may produce it. It can be very specific or may be only an outline that refers to the Pilot's Operating Handbook (POH) or FAA-approved Airplane Flight Manual (AFM).

Because the sequence of training may need to be altered to accommodate individual progress or special circumstances, the training guide/syllabus should be flexible. As complexity varies between airplane models, developers of Transition Training Guides may find it necessary to expand upon the information described herein. If the prescribed sequence of training is changed, it is the responsibility of the pilot training school or instructor to make sure that all necessary training is accomplished.

IFR TRANSITION TRAINING

Certain maneuvers in the flight section are prescribed as "IFR only". These maneuvers are required only for instrument rated pilots. They are included so that an instrument rated pilot in training (PT) may practice key IFR maneuvers in an unfamiliar airplane under the supervision of an instructor. PTs who are instrument rated and elect not to perform the IFR maneuvers, or PTs who are not instrument rated (VFR only) will receive a "VFR" endorsement in their logbook when training is satisfactorily completed. This type of endorsement indicates that only VFR transition training was completed. The presence or absence of this endorsement does not legally affect the pilot's instrument privileges in any airplane.

COURSE ELEMENTS

Scenario-based flight training (SBT) represents a non-traditional approach to GA pilot training. The most significant shift is observed in the move away from the traditional practice of analyzing a maneuver and breaking it down into manageable chunks, establishing behavioral objectives, and measuring performance based on those objectives. SBT uses the same maneuvers, for the most part, but attempts to arrange or script them into more "real world" learning experiences. Practice of the task remains the cornerstone of skill acquisition, but the shift is away from meaningless drill in the practice area toward meaningful application as a part of a normal flight activity.

While the traditional approach to civilian flight training certainly has served the industry, there is ample evidence of the need for modifications to our traditional perspectives on developing safe, competent and efficient pilots. The traditional approach to pilot training is driven by regulations that use flight hours and the ability to fly maneuvers within certain parameters as the benchmark of competency. The emphasis during training is on individual psychomotor skill and, to a limited extent, pilot decision-making. After completion of training, the pilot goes on to fly in an environment that asks them to use skills, apply knowledge, and make decisions unassisted.

Consequently, traditional flight training curricula lack the continuity, consistency, and activities characteristic of the TAA of the future

While this Master Syllabus does not utilize the more traditional maneuver-based method of learning, it does attempt to provide a coordinated ground/flight sequence of training so that educational support materials are covered prior to the associated flight lessons. Additionally, the simple-to-complex "building block" approach is maintained in that each lesson increases in complexity and the PT is provided the opportunity to practice the maneuver in a "real world" flight experience.

STANDARDS

Several training items require a discussion of the limitations of an airplane component or system. In every airplane system, there are limitations based on two factors:

1. The capability of the equipment to perform a particular function and;
2. The individual pilot's ability to use that equipment.

Effective training and experience can enable safe operation of an airplane within its limitations. Some airplane systems are more complex and require a higher level of skill and interpretation. Pilot skills and knowledge vary with a pilot's total flight time, time-in-type, and recent flight training or experience. Therefore, pilots must be trained to recognize their personal limitations and the airplane's limitations.

Throughout the ground school and flight curriculum, emphasis should be placed on operating within airplane and pilot limitations. Risk management and decision-making skills should be especially emphasized. A discussion of limitations, as they apply to the PT's experience level, and with reference to potential problem areas, may prevent many accidents. For that reason, Transition Training Guides should include items that instructors may discuss with transitioning pilots concerning limitations of various systems, flight characteristics of the specific airplane, and how these items may apply to a particular pilot.

GROUND TRAINING

The ground-based segments of the Master Syllabus are an integral part of the SBT course and should be mastered prior to in-flight training. The PT should demonstrate, through written and oral review, the knowledge to safely operate the specific airplane using the Pilot's Operating Handbook (POH) or FAA-approved Airplane Flight Manual (AFM) and airplane checklists. All immediate-action emergency procedures must be committed to memory. The instructor will discuss each incorrect response with the pilot to ensure complete understanding.

FLIGHT TRAINING

Each lesson in the flight-training phase of the SBT course consists of a scripted scenario, and each scenario increases in complexity as the PT progresses through the course. The instructor and PT should use the scenario as a "lesson plan" with the intent for the PT to study the plan and brief it as part of the pre-flight preparation.

The PT should demonstrate the necessary skill and experience required for the specific airplane. Operations must be accomplished within the parameters specified in the FAA Practical Test Standards (PTS) appropriate to the grade of PT's pilot certificate.

In addition, a PT who holds an instrument rating must demonstrate competency in the instrument maneuvers and procedures identified in the flight portion of the Master Syllabus within the parameters specified in the Instrument Rating PTS. If a PT chooses not to demonstrate competency in instrument flight in the specific airplane, the PT's logbook endorsement will indicate "VFR only". An instrument rated pilot with a "VFR only" logbook endorsement for Transition Training may remove the endorsement at a later date by completing the designated instrument maneuvers and training. The presence or absence of this endorsement does not legally affect the pilot's instrument privileges in any airplane.

Section 4 - FITS GPS-Moving Map Display Master Syllabus

GOAL

The goal of GPS Training is to help insure the PT can safely, efficiently, and effectively operate their specific type of GPS navigation equipment and use it to the fullest extent possible while performing flight operations appropriate to their certificate and type of flight operations.

MASTER SYLLABUS

This document, the Master Syllabus, is a general outline of the items to be included in the ground and flight training of pilots learning to use GPS navigation equipment with moving map displays. The Master Syllabus should be used by manufacturers, training companies, or flight instructors to develop a syllabus for specific models of GPS navigation equipment. The intended recipients of this training are those pilots who are equipping their aircraft with GPS navigation equipment that has a moving map display.

TRANSITION GUIDES

A GPS Training Guide is written for a specific make and model of GPS navigation equipment and is based on the Master Syllabus. It may be produced by any person or company, such as a Certificated Flight Instructor (CFI), training organization, manufacturer, or aviation publisher. Because sequence of training may need to be altered to accommodate individual progress or special circumstances, the training syllabus should be flexible. As technical complexity varies among specific GPS equipment makes and models, those who develop GPS Training Guides may find it necessary to expand upon the information described in the Master Syllabus. If the prescribed sequence of training is changed, it is the responsibility of the curriculum developer to make sure that all necessary training is accomplished.

STANDARDS

In every airplane system there are limitations based on two factors:

1. The absolute capability of the equipment to perform a particular function and;
2. The individual pilot's ability to use that equipment.

Effective training and experience can enable safe and effective operation of an specific type of navigation equipment within these limitations. Some makes and models of GPS navigation systems are more complex than others and require a higher level of skill and interpretation. Pilot skills and knowledge of GPS navigation with a pilot's total flight time, time-in-type, and recent flight training or experience. Pilots, therefore, must be trained to recognize their personal limitations as well as that of the particular make and model of GPS equipment.

Throughout the ground school and flight curriculum, emphasis should be placed on operating within airplane and pilot limitations. Risk management and decision-making skills (also referred to as Single Pilot Resource Management (SRM)) should be consistently integrated into each scenario. A discussion of limitations, as they apply to the pilot's experience level, and with reference to potential problem areas, will enhance the decision process. GPS Training Guides should include discussions of equipment limitations, operation of the specific equipment, and how to use the equipment in realistic situations.

GROUND TRAINING

The ground-based segments of the syllabus are an integral part of the SBT course and should be mastered prior to the in-flight training experience. The pilot-in-training (PT) should demonstrate, through written and oral review, the knowledge to safely operate the specific GPS equipment using the operating handbook or other guidelines. The CFI will discuss each incorrect response with the pilot to ensure complete understanding. The instructor must integrate SRM concepts and techniques in each of these discussions.

FLIGHT TRAINING

Each flight-training lesson consists of a highly scripted scenario. The first two scenarios focus on the PT learning to use the equipment and the third is where the PT demonstrated competence in both VFR and IFR scenarios. If the PT is receiving training for VFR use only, then the lesson on using the equipment in IFR settings need not be accomplished and the final scenario should focus only on those skills needed for VFR operations. The instructor and student should use the scenario as a "lesson plan." The intent is for the student to study the lesson script, prepare a scenario plan, and brief it as part of the preflight preparation.

The pilot-in-training should demonstrate the necessary skill and experience required for the specific equipment. Operations using the equipment must be accomplished within the tolerances specified in the Practical Test Standards appropriate to the pilot's airmen certificate.

LESSON 1
MASTER SYLLABUS – GPS with MOVING MAP DISPLAY- VFR OPERATIONS

OBJECTIVE

The Pilot in Training (PT) will demonstrate a basic knowledge of and proficiency in using the GPS navigation system installed in the aircraft in normal and emergency situations.

SCENARIO 1

Preflight

The PT will plan a 3-leg VFR cross-country flight, to include a full stop landing at two airports other than the departure airport, and return to the airport of origin.

The PT will describe his/her approach to management of avionics and the specific risks involved in this flight. The Instructor will provide the necessary guidance to insure that the plan provides for all the scenario activities and sub-activities listed for this lesson. The PT is evaluated on the ability to plan a comprehensive flight with conscious attention to all the required scenario activities.

The PT will practice all GPS preflight and set-up functions, program the flight plan, and the check the different modes of the avionics for each leg of the scenario. This will include appropriately setting the moving map display, checking the accuracy of the flight plan programming, and an effective pre-takeoff briefing. The PT should practice determining the system status and currency.

These Preflight activities will be accomplished prior to takeoff for each leg of the flight

Leg 1 (Outbound flight)
The PT will perform a normal takeoff and departure to a safe altitude. When established in the departure the autopilot will be engaged. Basic GPS functions will all be practiced during cruise, descent and normal landing phase of the flight. The VFR pilot will perform a normal descent and pattern transition followed by a normal approach and landing to a full stop. Experience has shown that this first leg should be kept very simple to allow the pilot to get more comfortable with operating the equipment.

Leg 2 (Outbound flight 2)
A different route will be programmed into the GPS flight plan for the second leg of the trip. During this leg, course diversions and nearest airport and facilities functions should be practiced. The PT should practice displaying and interpreting airspace, nav-aids, and airport information as available on the particular equipment. If practical, the PT should perform an actual diversion in VFR conditions to a destination other than the original destination for this leg.

Leg 3 (Return Flight)
A different route will be programmed into the GPS for the return trip. After the aircraft is established in cruise the PT will perform all the necessary functions of the GPS equipment, including any weather or traffic displays if so equipped. Any remaining functions that have not been previously covered on the first two legs should be covered, as well as any operations the PT may need additional practice performing.

Note to Instructor: To enhance the PT's ability to focus on GPS operation, the instructor may wish to fly the airplane when the PT is performing an operation for the first time. This will allow the PT to focus his/her attention on the equipment without being distracted by having to fly the airplane. After the initial performance of the task, the PT should then practice the operation while flying the aircraft.

Post-flight

The PT will perform all aircraft shutdown and securing procedures.

PREREQUISITES

Completion of training provider pre-training packet corrected to 100%.

Completion of a Quiz normal operating procedures, aircraft systems, and avionics corrected to 100%

PILOT IN TRAINING PREPARATION

Review the following:

a. Normal operating procedures in the operating handbook
b. A worksheet on VFR functions and operations
c. Airport information for departure and destination airports.
d. Route of flight information for both trips.
e. Aircraft and avionics systems display and procedures.

BRIEFING ITEMS

A. INITIAL INTRODUCTION:

PTs should have a clear understanding of the Pilot in Command concept and how command is transferred. This should include a detailed pre-takeoff briefing procedure and format.

B. SINGLE PILOT RESOURCE MANAGEMENT (SRM)

a. Basic pre-flight and in-flight decision making and risk management.

C. SAFETY

The following safety items should be briefed to all PTs

a. Mid-air collision avoidance procedures
b. Taxi procedures

Scenario One

(note: these activities will be completed as part of the training scenario and are not intended to be a list of training tasks to be completed in numerical order)

Desired Pilot in Training (PT) Scenario Outcomes – The object of scenario-based training is a change in the thought processes, habits, and behaviors of the PT during the planning and execution of the scenario. Since the training is "student-centered," the success of the training is measured in the following desired PT performances:

(I) Learner-Centered Grading involves both maneuver and single-pilot resource management (SRM) grading.

(i) Maneuver Grades (Tasks)

• Explain -- at the completion of the scenario the PT will be able to describe the scenario activity and understand the underlying concepts, principles, and procedures that comprise the activity. *Significant instructor effort will be required to successfully execute the maneuver.*

• Practice -- at the completion of the scenario the student will be able to plan and execute the scenario. *Coaching, instruction, and/or assistance from the CFI will correct deviations and errors identified by the CFI.*

• Perform -- at the completion of the scenario, the PT will be able to perform the activity without assistance from the CFI. *Errors and deviations will be identified and corrected by the PT in an expeditious manner. At no time will the successful completion of the activity be in doubt.* ("Perform" will be used to signify that the PT is satisfactorily demonstrating proficiency in traditional piloting and systems operation skills)

• Not Observed -- Any event not accomplished or required

(ii) Single Pilot Resource Management (SRM) Grades

• Explain -- the student can verbally identify, describe, and understand the risks inherent in the flight scenario. *The student will need to be prompted to identify risks and make decisions.*

• Practice -- the student is able to identify, understand, and apply SRM principles to the actual flight situation. *Coaching, instruction, and/or assistance from the CFI will quickly correct minor deviations and errors identified by the CFI. The student will be an active decision maker.*

• Manage/Decide -- the student can correctly gather the most important data available both within and outside the cockpit, identify possible courses of action, evaluate the risk inherent in each course of action, and make the appropriate decision. *Instructor intervention is not required for the safe completion of the flight.*

• Not Observed -- Any event not accomplished or required.

(II) Grading will be conducted independently by the student and the instructor, then compared during the post flight critique.

Lesson One Desired Outcomes

Scenario Activities	Scenario Sub Activities	Desired PT Scenario Outcome
Flight Planning	1. Scenario Planning 2. Preflight SRM Briefing 3. Decision making and risk management 4. GPS Operations appropriate for flight scenario 5. GPS System Modes 6. System Messages	1. Explain 2. Explain 3. Explain 4. Explain 5. Explain 6. Explain
Normal Preflight and Cockpit procedures	1. GPS Initialize and Status 2. GPS Setup 3. GPS Programming 4. Datacard Check/Update 5. COMM/NAV functions	1. Explain/Practice 2. Explain/Practice 3. Explain/Practice 4. Explain/Practice 5. Explain/Practice
Engine Start and Taxi Procedures	SRM/Situational Awareness During Taxi with GPS	Practice
Before Takeoff Checks	Setting GPS and Nav Indicators for Departure	Practice
Climb procedures	1. Navigation Programming 2. Situational Awareness, Task management, and ADM	1. Practice 2. Explain
Cruise Procedures	1. Flying Flight Planned Route 2. Direct-To Functions 3. In-flight Navigation programming 4. Task Management, SA, and ADM	1. Practice 2. Practice 3. Explain/Practice 4. Practice
GPS Operation and Programming	VFR a. Direct-To b. Nearest Airport/ARTCC/ FSS Information c. Airspace Depiction and Interpretation d. Flight Plan Changes e. Entering Waypoints f. Panning/Changing Display Ranges and Features g. Identification of Failure Modes	Explain/Practice

Descent Planning and Execution	1. Airport Information, including runways and frequencies, if so equipped. 2. Airport Arrival and Traffic Pattern Entry Planning 3. Navigation Programming for Arrival	1. Explain 2. Practice 3. Practice
Landing	1. Before Landing procedures 2. ADM and SA During Taxi Operations	1. Practice 2. Practice 3. Describe
Aircraft Shutdown and Securing procedure	Avionics Shutdown	Practice

LESSON 2
MASTER SYLLABUS – GPS with MOVING MAP DISPLAY- IFR OPERATIONS

OBJECTIVE

The Pilot in Training (PT) will practice IFR operations using the GPS with a moving map display.

SCENARIO 2

Preflight

The PT will plan a 3-leg IFR, actual or simulated, cross-country flight, to include a full stop landing at two airports other than the departure airport, and return to the airport of origin.

The PT will describe his/her approach to management of avionics and the specific risks involved in this flight. The Instructor will provide the necessary guidance to insure that the plan provides for all the scenario activities and sub-activities listed for this lesson. The PT is evaluated on the ability to plan a comprehensive flight with conscious attention to all the required scenario activities.

The PT will perform all avionics set-up, flight plan programming, and the different modes of the avionics for each leg of the scenario. This will include flight plan programming for the flight as well as GPS setup and an effective pre-takeoff briefing.

These Preflight activities will be accomplished prior to takeoff for each leg of the flight

Leg 1 (Outbound flight)
The PT will perform a normal takeoff and departure in accordance with the IFR clearance, either actual or simulated. If the GPS equipment allows for the programming of departure procedures, the PT should practice using this function. If the airplane has an autopilot, it's use should be encouraged so the PT can concentrate on practicing GPS programming and use of it's functions. These functions will be practiced during cruise, descent and normal landing phase of the flight. The IFR pilot will perform a normal descent and transition from the enroute phase to a GPS instrument approach and landing to a full stop. Experience has shown that this first leg should be kept very simple to allow the pilot to get more comfortable with the GPS equipment.

Leg 2 (Outbound flight 2)
A different route will be programmed into the GPS flight plan for the second leg of the trip. The PT will use the moving map/GPS to proceed to the destination and will perform a descent and transition to an instrument approach and full stop. During this leg, the PT should practice programming the approach, then canceling it and programming another approach, simulating a change that might be given by ATC. This could be as simple as programming the approach based on an expected transition, then changing it to a vectors-to-final approach.

Leg 3 (Return Flight)
A different route will be programmed into the GPS for the return trip. The PT will practice an in-flight change to the programmed flight plan route, execute the routing change, and proceed to the new destination and execute a GPS approach.

NOTE: At some point during the flight, the PT should practice a GPS transition to an ILS or a non-GPS non-precision approach, either a VOR, NDB, or LOC type approach. Also, on one segment, the PT should practice programming, entering, and leaving a holding pattern using GPS navigation. Also, the PT should practice at least one missed approach using the GPS for navigation during the missed approach and re-programming the equipment for and executing a second approach. These items are not specific for any one of the three legs as the airports and approaches available will vary by location, weather, and other factors.

Post-flight

The PT will perform all aircraft shutdown and securing procedures.

PREREQUISITES

Completion of training provider pre-training packet corrected to 100%.

Completion of a Quiz normal operating procedures, aircraft systems, and avionics corrected to 100%

PILOT IN TRAINING PREPARATION

Review the following:

a. Normal operating procedures in the GPS operating handbook.
b. A worksheet on systems and procedures.
c. Airport information for departure and destination airports.
d. Instrument approaches available for the flight
e. Route of flight information, weather, and NOTAMS.
f. Aircraft and avionics systems display and procedures.

BRIEFING ITEMS

A. INITIAL INTRODUCTION:

PTs should have a clear understanding of the Pilot in Command concept and how command is transferred. This should include a detailed pre-takeoff briefing procedure and format.

B. SINGLE PILOT RESOURCE MANAGEMENT (SRM)

Basic pre-flight and in-flight decision-making and risk management.

C. SAFETY

a. The following safety items should be briefed to all PTs
b. Mid-air collision avoidance procedures
c. Taxi procedures

Scenario Two

(note: these activities will be completed as part of the training scenario and are not intended to be a list of training tasks to be completed in numerical order)

Desired Pilot in Training (PT) Scenario Outcomes – The object of scenario-based training is a change in the thought processes, habits, and behaviors of the PT during the planning and execution of the scenario. Since the training is "student-centered," the success of the training is measured in the following desired PT performances:

(I) Learner-Centered Grading involves both maneuver and single-pilot resource management (SRM) grading.

(i) Maneuver Grades (Tasks)

• Explain -- at the completion of the scenario the PT will be able to describe the scenario activity and understand the underlying concepts, principles, and procedures that comprise the activity. *Significant instructor effort will be required to successfully execute the maneuver.*

• Practice -- at the completion of the scenario the student will be able to plan and execute the scenario. *Coaching, instruction, and/or assistance from the CFI will correct deviations and errors identified by the CFI.*

• Perform -- at the completion of the scenario, the PT will be able to perform the activity without assistance from the CFI. *Errors and deviations will be identified and corrected by the PT in an expeditious manner. At no time will the successful completion of the activity be in doubt.* ("Perform" will be used to signify that the PT is satisfactorily demonstrating proficiency in traditional piloting and systems operation skills)

• Not Observed -- Any event not accomplished or required

(ii) Single Pilot Resource Management (SRM) Grades

• Explain -- the student can verbally identify, describe, and understand the risks inherent in the flight scenario. *The student will need to be prompted to identify risks and make decisions.*

• Practice -- the student is able to identify, understand, and apply SRM principles to the actual flight situation. *Coaching, instruction, and/or assistance from the CFI will quickly correct minor deviations and errors identified by the CFI. The student will be an active decision maker.*

• Manage/Decide -- the student can correctly gather the most important data available both within and outside the cockpit, identify possible courses of action, evaluate the risk inherent in each course of action, and make the appropriate decision. *Instructor intervention is not required for the safe completion of the flight.*

• Not Observed -- Any event not accomplished or required.

(II) Grading will be conducted independently by the student and the instructor, then compared during the post flight critique.

Scenario Two Desired Outcomes

Scenario Activities	Scenario Sub Activities	Desired PT Scenario Outcome
Flight Planning	1. Scenario Planning 2. Preflight SRM Briefing 3. Decision making and risk management 4. GPS Operations 5. GPS System Modes 6. System Messages	1. Explain 2. Explain 3. Explain 4. Explain 5. Explain 6. Explain
Normal Preflight and Cockpit procedures	1. GPS Initialize and Status 2. GPS Setup 3. GPS Programming 4. Datacard Check/Update 5. COMM/NAV functions	1. Practice Practice 2. Practice 3. Practice Practice
Engine Start and Taxi Procedures	SRM/Situational Awareness During Taxi Operations	Practice
Before Takeoff Checks	Setting GPS and Nav Indicators for Departure	Explain/Practice
Takeoff	Instrument Departure Procedures	Explain/Practice
Cruise Procedures	1. Navigation programming 2. Task Management, SA, and ADM	1. Practice 2. Practice
GPS Operation and Programming	IFR a. Direct-To b. Nearest Airport Information c. VOR/NDB Information d. Approach Select e. Flight Plan Changes f. Changing display and features on moving map.	Explain/Practice
Avionics Operation	1. GPS Normal Operation a. Setup Pages b. Navigation Mode c. Checklist Mode 2. COM Radio Operations 3. NAV Radio Operations 4. Identification of Failure Modes	1. Explain/Practice 2. Practice 3. Practice 4. Explain/Practice
Descent Planning and Execution	1. Airport Information 2. Approach Selection 3. Navigation programming 4. GPS Holding	1. Practice 2. Practice 3. Practice 4. Practice

Instrument Approach procedures (IFR Rated Pilot)	1. GPS transition to an ILS 2. GPS transition to a non-GPS non-precision approach 3. GPS Approaches, full and vectors 4. Missed Approach 5. STAR Procedures	1. Practice 2. Practice 3. Practice 4. Practice 5. Practice
Landing	1. Before landing procedures 2. Instrument Landing 3. ADM and SA During Taxi Operations	1. Practice 2. Practice 3. Explain/Practice
Aircraft Shutdown and Securing procedure	Avionics Shutdown	Practice

LESSON 3
MASTER SYLLABUS – GPS with MOVING MAP DISPLAY
FINAL EVALUATION FLIGHT

OBJECTIVE

The pilot in training will demonstrate knowledge and skill level appropriate and demonstrate proficiency in GPS/Moving Map Display procedures in both VFR and IFR operations (VFR only if appropriate). The PT will be evaluated at the perform and decide manage level of proficiency in all operations. If the pilot is not instrument rated, only the VFR operations will be evaluated.

SCENARIO 3

Preflight

The PT will plan a cross-country flight to a different airport and return to the originating airport with little or no assistance from the instructor. The flight will consist of two legs, one operating under VFR and the other operating under IFR, actual or simulated. The flight profile will include GPS/Moving Map Operations in VFR and IFR operations. The choice of which leg should be VFR and IFR will be decided based on the routes and airports used and the available of instrument approaches at those airports.

Leg 1 (Outbound Flight)
The PT will perform a normal takeoff and departure to a safe altitude. When the PT is established in the departure necessary avionics and GPS/Moving Map Display functions will all be performed during cruise, descent and normal landing phase of the flight. The VFR pilot will perform a normal descent and pattern transition followed by a normal approach and landing to a full stop.

Leg 2 (Return Flight)
The PT will perform a normal takeoff and departure to a safe altitude. When the PT established in the departure avionics and GPS/Moving Map Display functions will all be performed during cruise, descent and normal landing phase of the flight. The IFR pilot will perform a normal descent and pattern transition followed by an instrument approach and landing to a full stop.

NOTE: While this scenario has Leg 1 as the VFR leg and Leg 2 as the IFR leg, these can be reversed or otherwise modified to accommodate the actual airports and approaches available.

Post flight

The PT will perform all aircraft and shutdown and securing procedures.

PREREQUISITES

Completion of a Worksheet on Abnormal & Emergency Procedures.
Completion of a progress Quiz on the material to be covered.

PILOT IN TRAINING PREPARATION

Review previous lessons
Review the POH
Plan flight profile using the scenario as listed above

BRIEFING ITEMS

A. INITIAL INTRODUCTION:
   a. GPS/Moving Map Display
   b. Flight profile
   c. Command transfer and pre-takeoff briefing

B. SRM
   a. Decision making, risk management
   b. Automation/task management
   c. Situational Awareness

C. SAFETY
   a. Mid-air collision avoidance procedures
   b. Appropriate NOTAMS
   c. Airport diagrams and taxi procedures
   d. Emergency procedures

Scenario Three

(note: these activities will be completed as part of the training scenario and are not intended to be a list of training tasks to be completed in numerical order)

Desired Pilot in Training (PT) Scenario Outcomes – The object of scenario-based training is a change in the thought processes, habits, and behaviors of the PT during the planning and execution of the scenario. Since the training is "student-centered," the success of the training is measured in the following desired PT performances:

(I) Learner-Centered Grading involves both maneuver and single-pilot resource management (SRM) grading.

(i) Maneuver Grades (Tasks)

• Explain -- at the completion of the scenario the PT will be able to describe the scenario activity and understand the underlying concepts, principles, and procedures that comprise the activity. *Significant instructor effort will be required to successfully execute the maneuver.*

• Practice -- at the completion of the scenario the student will be able to plan and execute the scenario. *Coaching, instruction, and/or assistance from the CFI will correct deviations and errors identified by the CFI.*

• Perform -- at the completion of the scenario, the PT will be able to perform the activity without assistance from the CFI. *Errors and deviations will be identified and corrected by the PT in an expeditious manner. At no time will the successful completion of the activity be in doubt.* ("Perform" will be used to signify that the PT is satisfactorily demonstrating proficiency in traditional piloting and systems operation skills)

• Not Observed -- Any event not accomplished or required

(ii) Single Pilot Resource Management (SRM) Grades

• Explain -- the student can verbally identify, describe, and understand the risks inherent in the flight scenario. *The student will need to be prompted to identify risks and make decisions.*

• Practice -- the student is able to identify, understand, and apply SRM principles to the actual flight situation. *Coaching, instruction, and/or assistance from the CFI will quickly correct minor deviations and errors identified by the CFI. The student will be an active decision maker.*

• Manage/Decide -- the student can correctly gather the most important data available both within and outside the cockpit, identify possible courses of action, evaluate the risk inherent in each course of action, and make the appropriate decision. *Instructor intervention is not required for the safe completion of the flight.*

• Not Observed -- Any event not accomplished or required.

(II) Grading will be conducted independently by the student and the instructor, then compared during the post flight critique.

Scenario Three

Scenario Activities	Scenario Sub Activities	Desired PT Scenario Outcome
Flight Planning	1. Scenario Planning 2. Preflight SRM Briefing 3. Decision making and risk management 4. GPS Operations 5. GPS System Modes 6. System Messages	1. Perform 2. Perform 3. Manage/Decide 4. Perform 5. Perform 6. Perform/ Manage/ Decide
Normal Preflight and Cockpit procedures	1. GPS Initialize and Status 2. GPS Setup 3. GPS Programming 4. Datacard Check/Update 5. COMM/NAV functions	1. Perform/Manage/ Decide 2. Perform 3. Perform 4. Perform/ Manage/ Decide 5. Perform
Engine Start and Taxi Procedures	SRM/Situational Awareness During Taxi Operations	Manage/Decide
Before Takeoff Checks	Setting GPS and Nav Indicators for Departure	Perform
Takeoff	IFR Departure Procedures	Perform
Climb procedures	1. Navigation programming 2. Situational Awareness, Task management, and ADM	1. Perform 2. Manage/Decide
Cruise Procedures	Navigation Programming	Perform
GPS Operation and Programming	1. VFR a. Direct-To b. Nearest c. Airport/ARTCC/ FSS Information d. Airspace Depiction and Interpretation e. Flight Plan Changes f. Entering Waypoints g. Panning/Changing Display Ranges and Features 2. IFR a. Direct-To b. Nearest c. Airport Information d. VOR/NDB Information e. Approach Select f. Flight Plan Changes g. Changing Display and Features on Moving Map.	1. Perform 2. Perform
Avionics Operation	1. GPS Normal Operation a. Setup Pages b. Navigation Mode	1. Perform

	c. Checklist Mode 2. COM Radio Operations 3. NAV Radio Operations 4. Identification of Failure Modes	 2. Perform 3. Perform 4. Manage/Decide
Descent Planning and Execution	1. Airport Information, including runways and frequencies, if so equipped. 2. Airport Arrival and Traffic Pattern Entry Planning 3. Navigation Programming for Arrival 4. Approach Select 5. GPS Holding	1. Manage/Decide 2. Manage/Decide 3. Perform 4. Perform 5. Perform
Instrument Approach procedures (IFR Rated Pilot)	1. GPS transition to an ILS 2. GPS transition to a non-GPS non-precision approach 3. GPS Approaches, full and vectors 4. Missed Approach 5. STAR Procedures	1. Perform 2. Perform 3. Perform 4. Perform 5. Perform
Landing	1. Before landing procedures 2. Instrument Landing Transition 3. Normal Landing 4. ADM and SA During Taxi Operations	1. Perform 2. Perform 3. Perform 4. Manage/Decide
Aircraft Shutdown and Securing procedure	Avionics Shutdown	Perform

Section 5 - FITS Master Learning Outcomes List

MFD 01	**GPS/Moving Map Equipment Operation**	
Lesson Objective- The student will demonstrate mastery of MFD equipment functions, the use of all available information depicted by the equipment for enhanced situational awareness, traffic identification and collision avoidance, planning, weather awareness, SRM, and Aeronautical Decision Making.		
Performance	Conditions	Standards
The training task is:	The training is conducted during:	The pilot in training will:
1. Overview of GPS/Moving Map System and Equipment Requirements	Pre-arrival eLearning, home study course, or classroom training	a) Be able to explain the major components of a general aviation GPS/Moving Map Display system and how they work together. b) Be able to explain the operation of the equipment installed on the training airplane. c) Be able to explain the different modes, functions, features, and display options of the equipment. d) Be able to explain the capabilities of the equipment with respect to VFR and IFR operations, the limitations associated with those operations, and what types of operations the equipment is certified to conduct.
2. GPS Equipment Operation	a) Pre-arrival eLearning, home study, or classroom training b) Simulator, training device, or static airplane c) In all phases of flight	a) Locate and be able to change the data card for the unit. b) Turn on the equipment, monitor system initialization, resolve any messages, and decide if the system is functional and current. c) Be able to operate all menu functions via the function keys, soft or "smart" keys, or other input devices. d) Change the range settings, change the map orientation, and be able to add and remove information from the display. e) Identification of failure modes.
3. Preflight Planning	a) Pre-arrival eLearning, home study course, or classroom training b) Pre-Flight Planning	a) Be able to determine the system status and decide if the unit is operating satisfactorily for the intended operation. This can include RAIM predictions and WAAS integrity if so equipped.

		b) Be able to decide if the data card is current and appropriate for the equipment.
4. Takeoff and Departure, Enroute, and Arrival Operations, with emphasis on SRM, ADM and Risk Management	a) Pre-arrival eLearning, home study course, or classroom training b) Simulator, training device, or static airplane c) In all phases of flight	a) Accurately program a complete flight plan into the system and be able to select a previously stored flight plan b) Activate the appropriate flight plan. c) Use the system to fly a departure from the airport and get established on the planned flight in both VFR and IFR operations. make adjustments to route of flight based on any changes. d) Select the appropriate map settings, ranges, and features appropriate for all phases of flight. e) Program course diversions or re-routes into the system, including appropriate use of the "direct-to" function, and "nearest" function. f) Select and activate instrument approach procedures, including approaches with procedure turns, transition fixes, and via vectors to final. g) Perform holding using GPS navigation. h) Perform missed approaches using GPS navigation. i) Cancel and reselect a different approach. j) Use the moving map display to plan arrivals into unfamiliar airports. k) use information to maintain situational awareness during taxi and other ground operations to avoid runway/taxiway incursions. l) Explain the limitations of GPS in all of the above operations.